



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

Malaysia-Japan
International
Institute of Technology
(MJIIT)



MJIIT INNOVATIVE KOHZA & CENTRE 2022

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iKOHZA

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HISTORY

The role played by the Look East Policy 1.0 in human resources development in Malaysia, through education exchanges and capacity building, and the promotion of people-to-people exchanges between Japan and Malaysia in the education sector, the establishment of MJIT was agreed by the prime minister of two countries during the ASEAN + 3 Summit in Bandar Seri Begawan in 2011. MJIT was established in August 2010 and was officially launched by Prime Minister of Malaysia, Dato' Seri Najib Tun Razak in 2012.

As part of the 10th Malaysia Plan, MJIT is expected to play a significant role in meeting the government's plan of increasing the number of knowledgeable human resources in advanced technology with good Japanese values. Being a G-G project, MJIT is privileged to be collaborating with Japanese universities as well as industries. In line with LEP 2.0, which was launched in 2013. MJIT is tasked to work towards becoming the ASEAN hub for Japanese oriented engineering education.

VISION

Leading in cutting edge technology education and research.

MISSION

- Providing Japanese style engineering education blended with Malaysia distinctiveness for sustainable industry and society.
- Leading in academic and research excellence in Electronics, Precision, Environmental & Green Engineering and Management of Technology.

A MESSAGE FROM THE DEAN



Welcome to Malaysia-Japan International Institute of Technology (MJIT), a vibrant entity at Universiti Teknologi Malaysia (UTM) Kuala Lumpur campus, situated approximately a mile from the iconic Petronas twin towers.

Established in 2010, MJIT has flourished in the areas of teaching and learning with a particular strong emphasis in research and development. Research in MJIT is facilitated through a Japanese-oriented innovative i-kohza system, which comprises members of academics and postgraduate research students. The concept of mentoring 'senpai-kohai' between senior academics and junior members within each iKohza enhances and expedites collaboration and innovation, and has empowered MJIT as one of the leading institutions for research within UTM KL campus since 2011.

Currently, 20 iKohza have been established and active in research to solve contemporary issues covering a broad range of technical specializations – including wind engineering, environmental systems, pattern recognition, artificial intelligence, vehicle systems, communication networks, advanced materials, Nano technology, disaster management and molecular biology. Through these iKohza and linkages with the Japanese Universities Consortium (JUC), MJIT has achieved the highest number of publications and citations in UTM Kuala Lumpur. With a strong focus on research, MJIT hopes to achieve a ratio of 2:1 for research students to undergraduate students by 2020. In addition, collaboration with industries is expected to grow significantly within this time frame, thus enabling greater exposure and opportunities for industry-based grants and research projects.

As the aim of the University is to be recognized as a world-class centre of academia and technological excellence, MJIT is committed to move in tandem with the University by producing excellent and well-balanced graduates with sound knowledge-base and competency in research and development who will serve the society effectively. Students and researchers with supervision from local and international staff are expected to perform and deliver their research findings in accordance to the global standard and provide service to the industry and community thereby bringing MJIT to greater heights.

I would like to invite researchers, industries, government agencies and others. to explore state of the art facilities and experience strong research and development culture at MJIT through strong collaborations with us and together we shall achieve great success in Research & Development (R&D) that will benefit society and industries.

Prof. Ts. Dr. Ali Selamat
Dean

ADVANCED DEVICES AND MATERIALS ENGINEERING (ADME)

- Professor Ts Ir Dr. Abdul Manaf Hashim, Professor (Head of iKohza)
- Dr. Rasli Abd Ghani, Senior Lecturer
- Dr. Shaharin Fadzli Abd Rahman, Senior Lecturer

NUMBER OF STUDENTS

- Ph.D: 7 students
- Master: 1 students
- Bachelor: 8 students

RESEARCH KEYWORDS

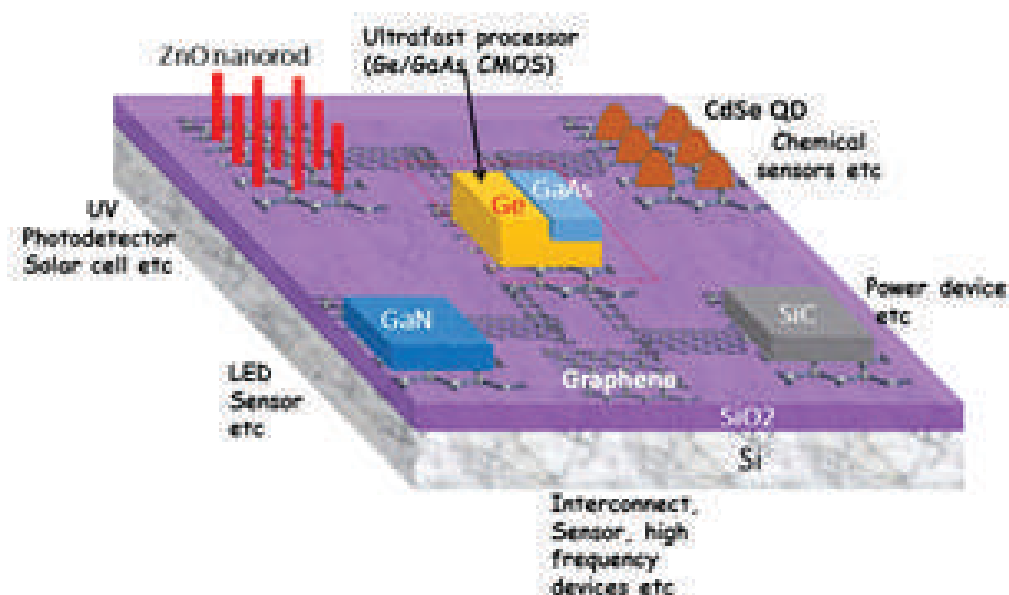
Research Keywords: Nanomaterial, sensor, functional material, nanodevice

OUTLINE OF IKOHZA

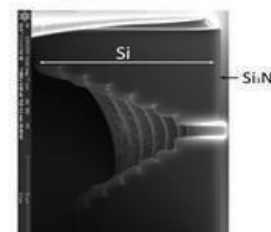
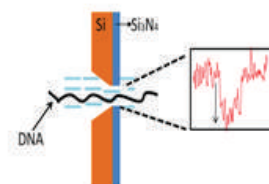
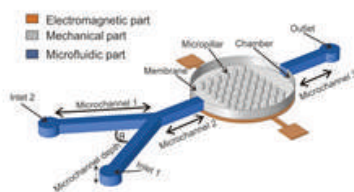
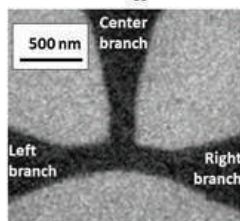
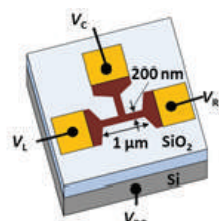
The Advanced Devices and Materials Engineering (ADME) ikohza is dedicated to conduct the R&D activities on the emerging nanomaterials, formation of nanostructures and novel micro-nanodevices for the applications in the future green electronics, and renewable and sustainable energy.

CURRENT RESEARCH

- Material Engineering Area : Synthesis/growth of carbon nanomaterials, semiconductors, organic/ molecular materials and bio-materials as well as their nanostructure formation technologies.



- Micro-nanodevice Area : Novel nanodevices and functional devices covering electronic/photonic devices, microfluidic devices, sensors and solar cells.
Three-branch junction device Micromixer DNA Sensors



MERIT OF THE TECHNOLOGY

The performance of silicon ultra-large-scale integrated circuits (Si-ULSIs) has been enhanced over the last 30 years by increasing the number of transistors in accordance with Moore's law. The scaling rule of the Si transistor has made it possible to miniaturize the transistors in the Si-ULSIs. However, the miniaturization of the transistors becomes increasingly difficult owing to the physical limitations, and the conventional scaling rule will not be enough to enhance the performance of the Si-ULSIs. Recently, the concept of advanced heterogeneous integration on Si platform was proposed towards the realization of a so-called "More than Moore" technology. Here,

semiconductor materials with superior properties are introduced on the Si platform in order to not only enhance the performance of MOS transistors but also facilitate the present Si-ULSIs with various functionalities where these materials can be used to fabricate various kinds of functional devices, such as optical devices, photodetectors, sensing devices, solar batteries, and so forth. As a next-generation technology, such intelligent system-on-chip (i-SoC) on Si is considered as a promising and practical direction. In line with this, we are developing various growth techniques of novel functional materials and investigating application to advanced devices.

POSSIBLE INDUSTRY APPLICATION

As a premier university-based research laboratory, our lab is well-equipped with the state-of-the-art facilities for micro-nanofabrication and material/device characterization. These facilities are placed in the clean rooms with class of 1,000 and 10,000. We provide open access, hands-on-training and courses to the entire university and to external users from both academia and industry. We highly value our users and we strive to offer an excellent facility-user experience. The facility is also accessible to outside organizations on a contract or collaborative basis.

POTENTIAL COLLABORATIVE AREA:

- Development of semiconductor fabrication and processing
- Characterization and analysis of materials and devices
- Development of novel semiconductor devices

Contact: Prof Ts Ir Dr Abdul Manaf Hashim
Email: abdmanaf@utm.my

AIR RESOURCES

- Ts Dr Khairunnisa binti Mohd. Pa'ad, Senior Lecturer (Head of IKohza)
- Professor Dr. Ezzat Chan bin Abdullah
- Ts Dr Nor Ruwaida binti Jamian, Senior Lecturer
- Ts Dr Abd Halim bin Md Ali, Senior Lecturer

NUMBER OF STUDENTS (AS FEB 15, 2022)

- Ph.D : 7 students
- Master: 14 students
- Bachelor: 9 students

RESEARCH KEYWORDS

Air Pollutions, Nanomaterials, Nanofibres, Environmental Engineering, Plasma Processing, Safety, Health & Environment

OUTLINE OF IKOHZA

The Air Resources group focuses on the safeguard of air resources or ambient air quality against man-made pollution. The research includes surveillance and quantification of pollutants that centres on detailed physical and chemical characterization of the pollutants in the ambient air or from stationary sources. The research is directed towards fine particulate size fraction that has a strong association with anthropogenic or man-made pollution sources, which is difficult to control and is known to impose health problems.

Recently, air resources ikohza also focused on Environmental Engineering, Nanomaterial's synthesis and characterization and safety, health and environment

CURRENT RESEARCH

- **AIR RELATED RESEARCH:**
Air Pollution Control Technology, Atmospheric Microplastics, Air Pollution Sampling & Monitoring, Development of Passive and Active Air Samplers
- **NANOMATERIALS:**
Synthesis of nanomaterials, electrospun fibres, graphene, carbon nanotube, synthesis of CO₂ absorbent, cancer nanomaterials, fuel cells
- **NON-THERMAL PLASMA:**
Non-plasma technology, plasma chemistry, plasma physics
- **ENVIRONMENTAL ENGINEERING:**
Non-agricultural waste management, occupational health and safety, disaster risk management



MERIT OF THE TECHNOLOGY

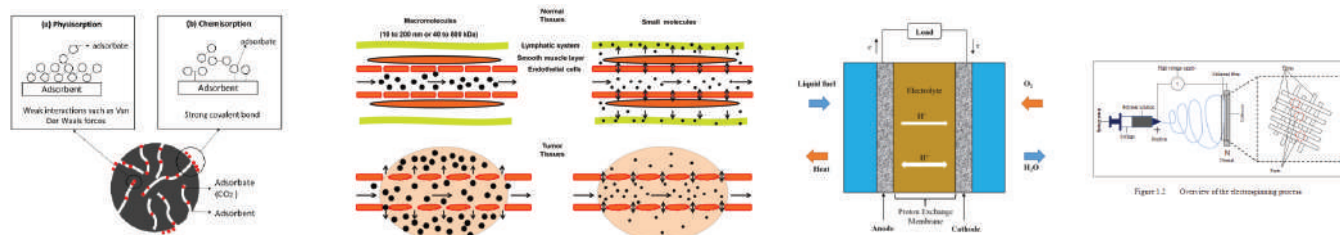
Air Resources iKohza is initially centered for the air pollutions and its solution. Recently, we also expanded our research expertise to nanomaterials, fuel cells and non-thermal plasma.

AIR RELATED RESEARCH:

Nowadays, for example biomass residue such as palm fibre and shell is used as fuel in the mill boiler to generate electricity. This process helps to dispose of the abundance of these waste materials. However, the combustion process releases tremendous number of particulates which can be harmful to the environment. Hence in this iKohza, we are committed to search for solution for these kinds of issues as we provide consultations and field sampling before analysing the samples physical and chemical properties.

NANOMATERIALS:

In this iKohza, biomass-based (e.g., carbon soot, banana peels, starch etc.) adsorbent is developed to adsorbed carbon dioxide and heavy metals. The adsorbent either exist as nanoparticles or nanofibers. The synthesis of the nanoparticles is using electrospray method and the development of the fibre is using the electrospinning method. These two methods not only useful to make the adsorbent, but also other kinds of nanomaterials, such as nanocarrier (used for drug delivery), fuel cells materials and solar cells nanoparticles.



POSSIBLE INDUSTRY APPLICATION

As the only Air Resources iKohza in UTMKL, our lab is well-equipped with the facilities for air sampling, air related research and nanomaterials synthesis and characterization. The facilities are also accessible to outside organizations on a contract or collaborative basis.

POTENTIAL COLLABORATIVE AREA:

- Development of air samplers (passive, active samplers)
- Characterization and analysis of microplastics, air pollutions substance, materials (nanoparticles and nanofibers)
- Development non-thermal plasma for industrial usage
- Development of nanoparticles for the cancer treatment

Contact: Ts Dr Khairunnisa binti Mohd. Pa'ad
Email: khairunnisa.kl@utm.my

ALGAL BIOMASS (ALGAE)

- Associate Professor, Dr. Koji Iwamoto (Head of iKohza)
- Associate Professor, Dr. Shaza Eva binti Mohamad
- Associate Professor, Dr. Norhayati binti Abdullah

NUMBER OF STUDENTS

- Ph.D : 7 students
- Master: 8 students
- Bachelor: 8 students

RESEARCH KEYWORDS

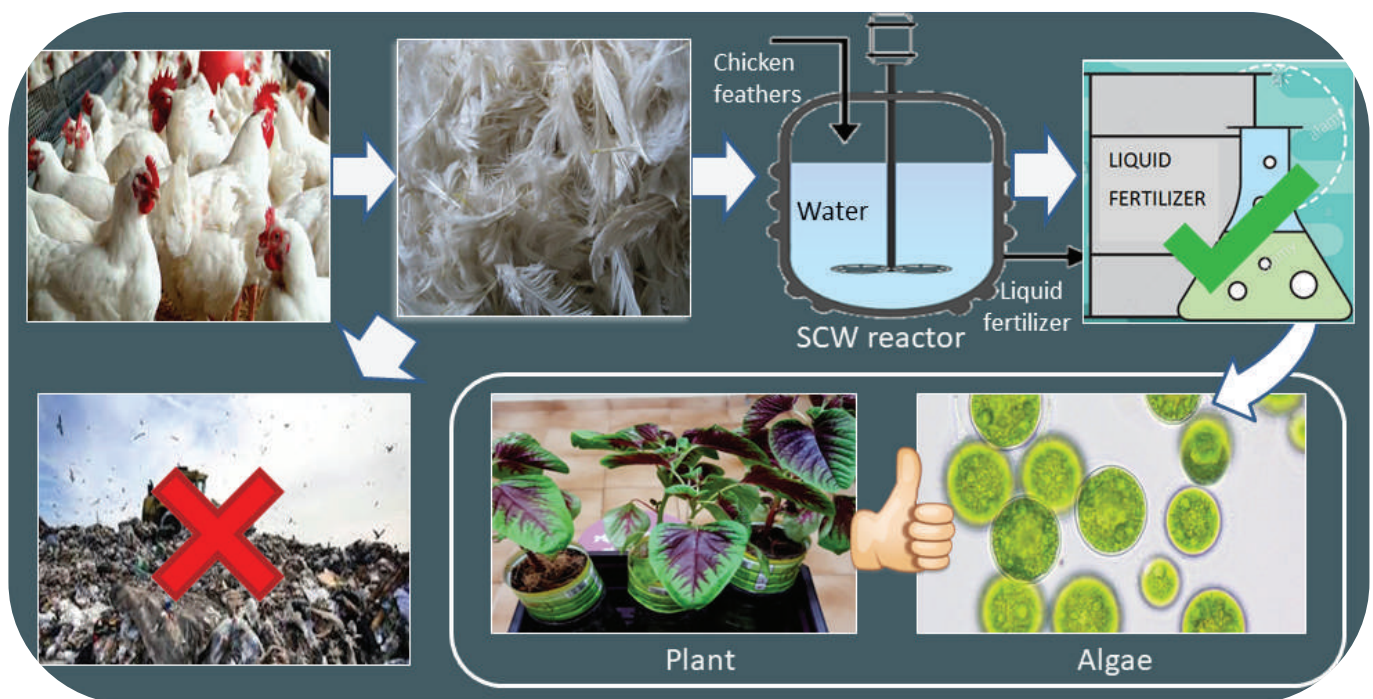
Algae, Microbes, Biomass production, Wastewater, Organic waste

OUTLINE OF IKOHA

The final goal of my research is to construct the sustainable society by solving the energy and environmental problems using aquatic plants, algae, and microbes. Since the Algae and Biomass Research Laboratory will be established soon, we speed up our research to the goal.

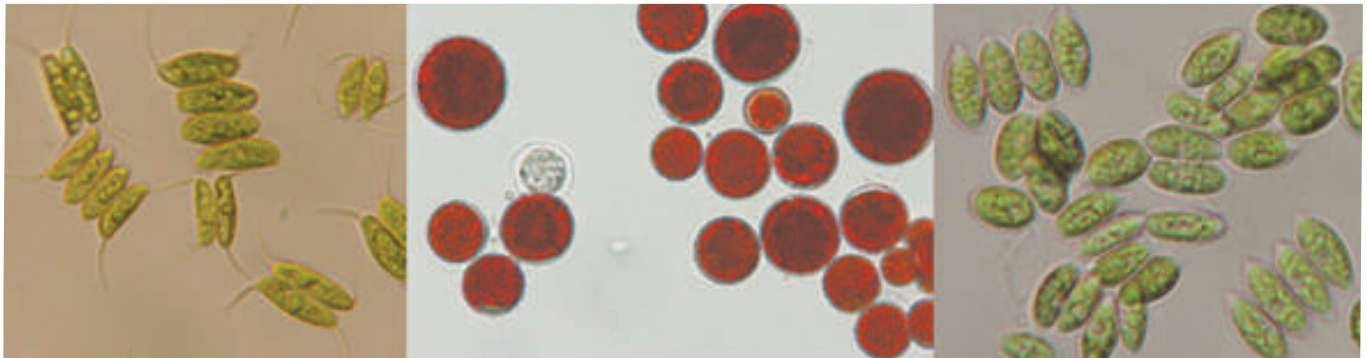
CURRENT RESEARCH

- **RESEARCH1:**
Utilization of chicken feather for fertilizer production by subcritical water treatment.



• **RESEARCH 2:**

Enhancement of valuable products such as astaxanthin, omega-3 fatty acid and lipids in microalgae.



• **RESEARCH 3:**

Energy effective wastewater treatment by activate granular sludge and microalgae-bacteria aerobic granular sludge.



MERIT OF THE TECHNOLOGY

- 1) Isolation, Identification and characterization of algae and microbes.
- 2) Facility and technology of algae mass culture.
- 3) Subcritical water treatment technology.
- 4) Water treatment and phytoremediation technology.

POSSIBLE INDUSTRY APPLICATION

- Isolation and identification of new capable algal strains.
- Mass cultivation (1000L scale) of algae.
- Removal/ recovery of heavy metals/ precious metals
- Wastewater treatment.

Contact: Dr. Koji Iwamoto
k.iwamoto@utm.my

ALGAL BIOMASS (ALGAE)

BIOLOGICALLY INSPIRED SYSTEMS AND TECHNOLOGY (BIO-IST)

- Assoc Prof Dr Mohd Fauzi Bin Othman Associate Professor, Head of iKohza
- Assoc Prof Dr Shahrum Shah Abdullah Associate Professor

NUMBER OF STUDENTS

- Ph.D.: 10 students

RESEARCH KEYWORDS

Neural System, Self-Organization Learning, Swarm Intelligence, Intelligent System, Manufacturing Robot, Neural Network and Artificial Intelligence, Intelligent Control, Underwater Robotic, Deep Learning and Control System

OUTLINE OF IKOHZA

Biologically Inspired System and Technology (BIST) Laboratory" is interesting, developing and demonstrating innovative and advanced technology for the well-being of mankind. Although there are many approaches for studying the technology that mimics nature, this research laboratory advances it mostly from a standpoint of system engineering.

Our SDGs



CURRENT RESEARCH

BIOMIMETIC

Biomimetic is the study of sophisticated mechanism, function, and structure, which human being, animals, and plants have, as models for developing human-friendly system and technology and apply methods and systems found in nature to systems and technology. Biological systems have been optimized for wide variety of environments and tasks on a long road of evolution. They are multi-functional and are not specialized for only one task, e.g. the application to develop.

Currently, our target is to model machines that mimic the human eyes and to develop its hardware realization into integrated circuit design, we are focusing on following targets:

- Machine Vision
- Motion Control
- Bio-Signal processing.

OPTIMAL CONTROL & OPTIMIZATION

An optimal control system seeks to maximize the return from a system by minimizing a certain cost while optimization seeks to select a best element (with regard to some criteria) from some set of available alternatives. Topics related to optimal control and optimization theory include:

- The Linear Quadratic Regulator
- Multivariable Control
- Robust Control
- Adaptive and Learning System
- System Identification.

Among the objectives of research in this area is to apply these methods to control or optimize artificial biological systems such as robots, artificial limbs and synthetic tissues. In addition to this, applying the concepts and behaviors of biological systems to solve control and optimization problems will also be the focus of research in this area.

MERIT OF THE TECHNOLOGY

BIO-INSPIRED LEARNING

The aim of this research is to study and analyze the bio-inspired learning process for development and application of machine learning. The research will mainly involve in modeling and simulation of the system architecture. The system will have based as a tool for various application e.g. data mining, image detection, power prediction etc. Currently, following titles are mainly focused:

- Spiking Self Organized Map for Short-Term Load Forecasting
- Modular Neural Network for Thermal Imaging Detection
- Supervised Learning model for Photovoltaic Power Prediction

POSSIBLE INDUSTRY APPLICATION

The Bio-Ist iKohza was founded to establish research activities on these bases which focus on but not limited to neuroimaging, biosensors application, affective neuroscience, consumer neuroscience and IoT smart devices application. The laboratory is developing collaboration with MIMOS. Currently, MIMOS' R&D activities revolve around economic impact-driven and strategic-driven areas, which cover E&E including Renewable Energy & Future Grid; Electric & Autonomous Vehicle (EAV), E&E manufacturing; and Automation and Sensory in primary sectors.

POTENTIAL COLLABORATIVE AREA:

- Stereo Vision for Autonomous Vehicle
- Precision Agriculture using Deep Learning.
- Reinforcements Learning for Manufacturing Robot

Contact: Assoc Prof Dr Mohd Fauzi Bin Othman
Email: mdfauzi@utm.my

CHEMICAL ENERGY CONVERSIONS AND APPLICATIONS (CHECA)

IKOHZA TEAM (RESEARCHERS):

Assoc Prof. Dr. Kamyar Shameli, Associate Professor, Head of ikohza
 Prof. Dr. Mohamed Mahmoud El-sayed Nasef, Professor
 Assoc Prof. Dr. Roshafima binti Rasit Ali, Senior Lecturer
 Dr. NurFatehah Wahyuni binti Che Jusoh, Senior Lecturer
 Dr. Nurulbahiyah binti Ahmad Khairudin, Senior Lecturer
 Ts. Dr. Vekes A/L Balasundram, Senior Lecturer
 Dr. Zatil Izzah binti Ahmad Tarmizi, Senior Lecturer

NUMBER OF STUDENTS

- Ph.D : 16 students
- Master: 12 students
- Bachelor: 19 students

RESEARCH KEYWORDS

- Nanoscience and Nanotechnology
- Functional Polymeric Materials, Membranes, Radiation Grafting
- Homo/Heterogeneous Catalysis, Photo Catalyst
- Renewable Energy, Biomass for Biofuels Production
- Environmental Green Chemistry
- Molecular Simulation, Structural Bioinformatics
- Drug Delivery, Biomedical Science

OUTLINE OF IKOHZA

The Chemical Energy Conversions and Applications (ChECA) research laboratory is dedicated for the promotion of research on sustainable energy development via the application of fundamentals of chemical energy conversion reactions and development of new materials to enhance their efficiency. Our research involves development of variety of functional materials and advanced systems such as nanocomposite catalysts, photo-devices, functional membranes to develop sustainable energy and store it in various forms by fuel cells, biomimetic devices, and photovoltaic systems.

CURRENT RESEARCH

RESEARCH1: INDUSTRIAL GRANT

Efficient method for production of nanocellulose based membrane fiber supported by copper nanoparticles for preparation of high-performance air filters (Total: RM100,000)



RESEARCH 2: FRGS MOHE GRANT

Unravelling the Effect of Gold Nanoparticles with Chitosan Nanobubbles through Double Emulsion Technique as Anticancer Drug Delivery System (Total: RM116,098)



RESEARCH 3: INDUSTRIAL GRANT

Novel Integrated Technique of Acidic and Base Catalyst in Microalgae Pyrolysis for 3G Aviation Biofuel Production: Resolving COVID-19 Impact on Global Airline Industry (Total: RM105,000)



RESEARCH 4: GOVERNMENT GRANT

Synthesizing the Bio-based Fibres Flame Retardant (FRs) using Gamma Radiation Method Incorporated Nano Metals as Additive (Total: RM20,000)



• **RESEARCH 5: INDUSTRIAL GRANT**

Magnetic-base Modified Palm Kernel Shell Biochar Adsorbent in Resolving Langat River Water Pollution (Total: RM 15,000)



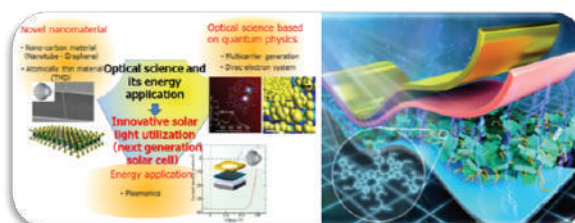
• **RESEARCH 6: INDUSTRIAL GRANT**

Pullulan mediated copper nanoparticles synthesis and its catalytic activity in degradation of dyes (Total: RM 10,000)

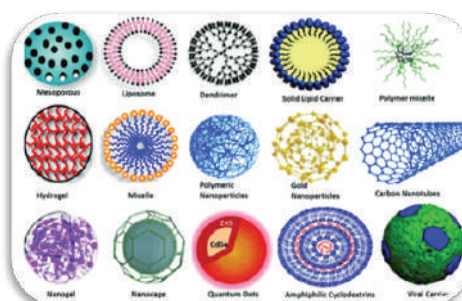


MERIT OF THE TECHNOLOGY

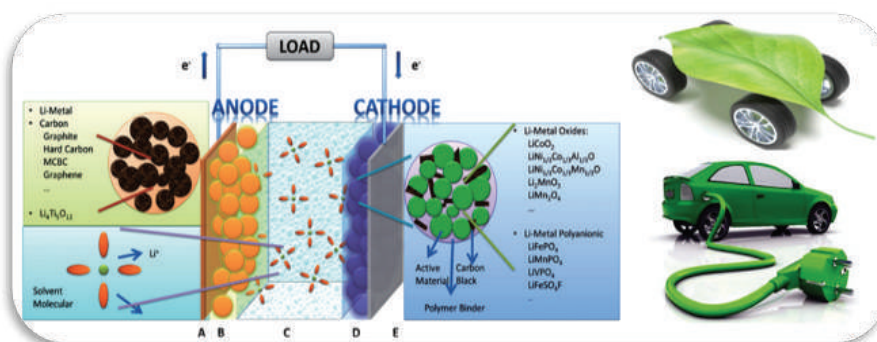
1) Sustainable Energy Development by Functional Materials



2) Nanoscience and Nanotechnology



3) Green Energy Production, System and Application



POSSIBLE INDUSTRY APPLICATION

- Physicochemical characterization and analysis of materials using advanced analytical instruments.
- Consultation with highly skilled experts in related fields.
- Implementing semi-industrial and industrial projects and performing quantitative and qualitative analysis in research related to energy conversion, nanomaterials & nano-drug production, fuel cells, and also special polymers.
- Performing quantitative and quantitative laboratory control tests to confirm the quality of the product.

Contact: Assoc. Prof. Dr. Kamyar Shameli,
Email: kamyar@utm.my

COMMUNICATION SYSTEMS & NETWORKS (CSN)

- Professor Dr. Yoshihide Yamada Professor, Head of ikohza
- Assoc. Prof. Dr. Wan Haslina Hassan, Associate Professor
- Ir. Dr. Kamilia Kamardin, Senior Lecturer

NUMBER OF STUDENTS

- Ph.D : 11 students
- Master: 2 students
- Bachelor: 8 students

RESEARCH KEYWORDS

- Antennas and Propagation
- Antenna for Human Health Care
- Radar Cross Section
- Cognitive Radio Networks
- Cloud Computing
- Network Security
- Industrial Cybersecurity
- Mobile Communication

OUTLINE OF IKOHZA

Communication Systems & Networks Research Lab (ikohza) is an inter-disciplinary group focusing on cutting-edge research in the development of reliable and efficient delivery of information for future Internet. It encompasses several areas of research including, but not limited to, telecommunication engineering, mobile communications, antenna and radio wave technology, wireless sensor networks (WSN), intelligent algorithms, network security and healthcare system. The main objective of the group is to establish a world-class collaborative research environment harnessing expertise from Malaysia, Japan, and abroad.

CURRENT RESEARCH

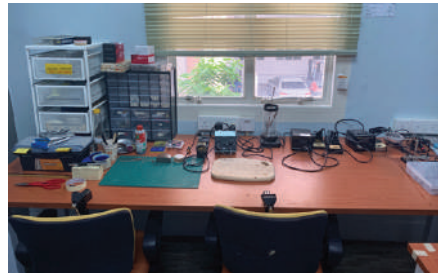
- **RESEARCH1: FRGS MOHE GRANT**
Investigations of Reflector Shaping Method of Dual Reflector Antenna for Multi Beam Performances (Total: RM64,400)
- **RESEARCH 2: UTM PROTOTYPE RESEARCH GRANT**
Fabrication of Base Station Antennas for 5G Mobile System (Total: RM75,000)
- **RESEARCH 3: UTM TIER 2 GRANT**
Estimation of Electrical Power Concentration Inside Human Body by Distributed Array Antenna Illumination for Hyperthermia Application (Total: RM30,000)
- **RESEARCH 4: JICA GRANT**
Electrically Small and Implantable Antennas for Biomedical Applications (Total: RM180,000)
- **RESEARCH 5: UTM TIER 2 GRANT**
Detection Model Using Multidimensional Factors for Insider Threat in Organization (Total: RM30,000)
- **RESEARCH 6: PROFESSIONAL DEVELOPMENT RESEARCH UNIVERSITY GRANT SCHEME**
Self-Optimisation in Heterogeneous Networks for Next Generation 5G Systems (RM 126,000)



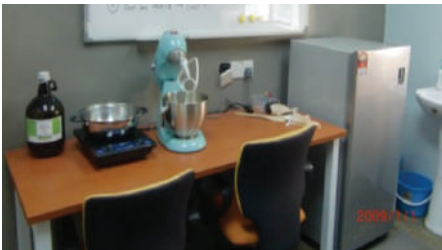
MERIT OF THE TECHNOLOGY

1) Antenna Measurement Facility

- Antenna fabrication room



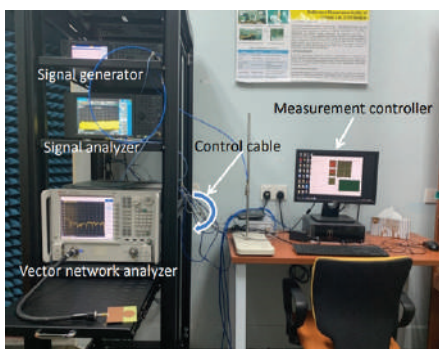
- Phantom fabrication room



- Anechoic chamber



- Measurement system



POSSIBLE INDUSTRY APPLICATION

1. Consultation on Anechoic Chamber design
2. Trainings for industry on antenna measurements
3. Anechoic chamber rental for antenna measurements

Contact: Prof.Dr.Yoshihide Yamada
Email: yoshihide@utm.my

EMBEDDED SYSTEM (ES)

- Assoc Prof. Dr. Ooi Chia Yee, Associate Professor, Head of Ikohza
- Madam Nordinah Ismail

NUMBER OF STUDENTS

- Ph.D : 1 students
- Master: 4 students
- Bachelor: 6 students

RESEARCH KEYWORDS

- Digital Systems Design
- Design-for-Testability
- FPGA
- IoT-enabled System

OUTLINE OF IKOHZA

Embedded systems are everywhere in our daily lives. Now they are connected and networked to build IoT (Internet of Things). While embedded systems and IoT make our lives easier, they cause several concerns such as security, privacy, and so-called big brothers. Our Embedded System Research Laboratory (ES iKohza) covers very wide engineering field including algorithm, S/W, electronic circuits, I/F, LSIs, computer architecture, communication and networks

to provide solutions for these concerns. Current research topics include H/W Trojans, 3D-Integration, Application of Block Chain, and/or PUF (Physically Unclonable Functions) to IoT, and so on. Laboratory members are encouraged to have at least one expertise in some engineering field and collaborate with other members to provide a solution for certain application/ requirement with embedding technology.

CURRENT RESEARCH

• RESEARCH1: UTM ENCOURAGEMENT RESEARCH

Lightweight Secure RISC-V Processor for Smart Home in Internet of Things (Total: RM20 , 000)

• RESEARCH 2: FRGS MOHE GRANT

Unravelling the Effect of Gold Nanoparticles with Chitosan Nanobubbles through Double Emulsion Technique as Anticancer Drug Delivery System (Total: RM116,098)



MERIT OF THE TECHNOLOGY

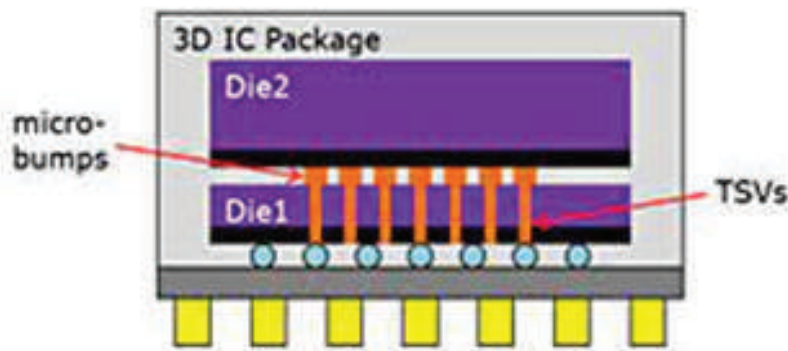
1) FIELD PROGRAMMABLE GATE ARRAY (FPGA)

Our research involves many aspects of FPGA including hardware acceleration of various algorithms such as machine learning, utilizing physical unclonable function (PUF) of FPGA for security purpose and development of reconfigurable processors.



2) DESIGN-FOR-TESTABILITY TECHNIQUES

Our research covers Design-for-Testability solutions for conventional 2D IC to 2.5D IC and 3D IC, which involves perspectives of test structures such as scan and built-in self-test, test planning which could utilize IEEE standards P1500, 1149 and 1687, and test data analysis using machine learning techniques.



3) IOT- ENABLED EMBEDDED SYSTEMS

Embedded systems and IoT are pervasive technology in today's realm. Our research tries to explore building embedded system solution in daily application that could enhance work and quality of living of focused population e.g. aged, limited mental health condition. We are open for the platform to leverage from simple IoT-based wearables to high-tech FPGAs.

4) ADVANCE HARDWARE ARCHITECTURE

Our research explore the possibility of applying RISC-V architecture, to implement systems that can support several communication protocols which are essential for IoT applications. Since IoT smart home systems usually require a lot of sensors and connected nodes for various purposes, it is better to have as many different communication protocols as possible. Different communication protocols being used in IoT systems include both wired and wireless ones, such as WiFi, Bluetooth, ZigBee, SPI, I2C and so on.

POSSIBLE INDUSTRY APPLICATION

- Evaluation of material strength and functional characteristics
- Structural analysis
- Development of embedded microcomputer
- Improving the quality of software documentation etc.
- Intel

Contact: Ooi Chia Yee at
Email: ooichiayee@utm.my

EMBEDDED SYSTEM (ES)

ENGINEERING MATERIALS AND STRUCTURE (EMAST)

- Prof. Ir. Dr. Saiful Amri Mazlan Professor, Head of Ikohza
- Ts. Dr. Nur Azmah Nordin, Senior Lecturer
- Ts. Dr. Nurhazimah Nazmi, Senior Lecturer
- Ts. Dr. Norhasnidawani Johari, Senior Lecturer
- Dr. Syahir Yasin Bin Mohd Yusuf, Senior Lecturer
- Dr. Hafizal Bin Yahaya, Senior Lecturer

NUMBER OF STUDENTS

- Ph.D : 31 students
- Master: 19 students
- Bachelor: 7 students

RESEARCH KEYWORDS

- Magnetorheological
- Coating
- Nanomaterials
- Composite
- Machine Learning
- Thin Film
- Artificial Intelligence
- 3D Printing

OUTLINE OF IKOHZA

In EMAST i-kohza, the nano- or microstructures of various functional materials and devices are characterized quantitatively and the formation processes are analyzed based on materials science and engineering. Novel processes for improved materials and devices are then proposed and developed.

CURRENT RESEARCH

RESEARCH1: UTM-TDR GRANT

Rheological and Resistivity of a Novel Magnetorheological Elastomer for future Force-Sensing Applications (Total: RM 240,000)



RESEARCH 2: PRGS MOHE GRANT SCHEME

Prototype of Semi-Active MRE Engine Mounting for Automotive Application (Total: RM 168,000)



RESEARCH 3: CRG UTM GRANT

Field Dependent Properties of Smart Grease for Controlling Ankle Foot Orthosis (Total: RM 100,000)



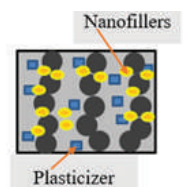
RESEARCH 4: UTM-PR GRANT

Prototype Semi-Active Magnetorheological Elastomer Bushing for Automotive Application (Total: RM 80,000)



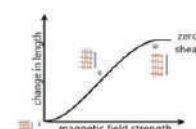
RESEARCH 5: PDRU UTM GRANT

Magnetorheological Elastomer Properties with the Addition of Plasticizer and Nano Additive for Force Sensor Application (Total: RM 138,460)



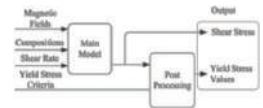
RESEARCH 6: JICA GRANT

Magnetostrictive of Magnetorheological Foam for Soft Force Sensor Technology (Total: RM 180,000)



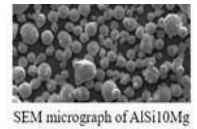
• **RESEARCH 7: FRGS MOHE GRANT SCHEME**

A field-dependent rheological model of magnetorheological grease with different types of oils using machine learning approach for future assistive device in rehabilitation (Total: RM 122,400)



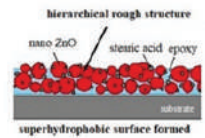
• **RESEARCH 8: INDUSTRIAL GRANT**

Enhanced Properties of Additively Manufactured AlSi10Mg via Nanostructuring through Severe Plastic Deformation for Lightweight Automotive Applications (Total RM 117,000)



• **RESEARCH 9: UTM ENCOURAGEMENT RESEARCH**

Development of self-healing nanocoating for anticorrosion (Total: RM 30,000)



MERIT OF THE TECHNOLOGY

1) AUTOMOTIVE



Bushing



Damper

2) BUILDING, BRIDGE



Isolator

3) BIOMEDICAL



Foot orthosis

POSSIBLE INDUSTRY APPLICATION

- Smart material development
- Evaluation of material performance

Contact: Prof. Ir. Dr. Saiful Amri Mazlan
Email: amri.kl@utm.my

INTELLECTUAL PROPERTY AND INNOVATION MANAGEMENT (IPIM)

- Assoc. Prof. Dr Akbariah Mohd Mahdzir, Associate Professor, Head of iKohza
- Dr. Syarifah Zyurina Binti Nordin, Senior Lecturer
- Dr. Mohammad Ali Tareq, Senior Lecturer
- Ts. Dr. Aizul Nahar Bin Harun, Senior Lecturer
- Dr. Rahayu Binti Tasnim, Senior Lecturer
- Ts. Dr. Zulhasni Bin Abdul Rahim, Senior Lecturer
- Dr. Amir Syafiq Syamin Syah B. Amir Hamzah, Senior Lecturer
- Dr. Hafizah Farhah Binti Saipan @ Saipol, Senior Lecturer

NUMBER OF STUDENTS

- Ph.D : 46 students • Master by Research: 8 students • Master by Taught Course : 27 students

RESEARCH KEYWORDS

Intellectual Property Management; Innovation Management; Business Analytics; Finance; IOT; TRIZ; Psychometrics; Entrepreneurship;

OUTLINE OF IKOHZA

IPIM iKohza consists of a multidisciplinary team of experts analyzing latest global trends in innovation management including those related to specific customer requirements which focuses particularly on research related to Intellectual property Management (IPM) and Innovation Management as seen by the different backgrounds of the members of the IPIM iKohza at MJIT.

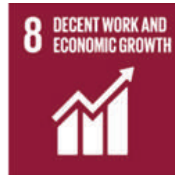
The research focuses on development of new tools to support decision-making and policy planning, and identifying best techniques for businesses and organizations to exploit innovations as they are developed. This lab offers technical and strategic knowledge for different industries combined with cutting edge innovation practices and experience in high technology business.

Research merges expertise in innovation management, business savvy, technical management and corporate exposure to mitigate errors in innovation and strategic management, thus optimizing the degree of success for organizations.

CURRENT RESEARCH

1. How Company Manages Intellectual Assets in Open Innovation Era?
2. Does Patent Quality Differ among Firms in Japanese Chemical Sectors?
3. The role of shareholders and creditors' rights in affecting cash holdings and firm value: A recent evidence from ASEAN
4. International Journal of Finance & Economics
5. Investigation on Performance Benchmark of Interior Glare in Malaysia's Building Environmental Sustainability Tools
6. Predictive model of Enhance Extreme Learning Scheme for IoT-RFID data streams on object tracking
7. The Value of Big Data Analytics Pillars in Telecommunication Industry
8. Nanotechnology in Malaysia: A qualitative study on the current occupational health and safety issues
9. The Application of TRIZ in The Development of Readiness Assessment Model for The Malaysian Industry4WRD Program

10. A Review of Risks for BIM Adoption in Malaysia Construction Industries: Multi Case Study



MERIT OF THE TECHNOLOGY

• INNOVATION MANAGEMENT

Innovation Management processes and change management are combined in innovation management. It refers to innovation in product, business process, marketing, and organizational settings.

The goal of Innovation Management is to understand what separates those who succeed from those who fail. It is a field of study that bridges the gap between technology and its application in society. Its primary concern is to comprehend how technologies are generated and how they may be used to benefit society. This entails comprehending the innovation process and determining how to improve its efficacy.

Innovation Management, among other things, investigates how ideas are transformed into goods and technology that are then used to better people's lives and society. Understanding how to foster creativity, analyses consumer behavior and preferences, drive innovation, fund technology initiatives, and effectively manage technology enterprises are all part of this.

• INTELLECTUAL PROPERTY MANAGEMENT

IPM approach aims at generation of IP, protection, and leveraging the same into the market and increasing revenue. Businesses realized that better decisions begin with greater insights.

Finding the proper insights to address crucial innovation issues is growing increasingly difficult as the number of worldwide patent data grows.

This ikohza conducts study in order to make more confident conclusions. What we need is a complete perspective of patent information to help us make strategic decisions What needed is a complete perspective of patent information to help us make strategic decisions hence, the research team is working on this aspect.

POSSIBLE INDUSTRY APPLICATION

- Innovation Management
- Intellectual Property Management – including IP Analytics, IP related consultancy

Contact: AP Dr Akbariah Mohd Mahdzir
Email: akbariah.kl@utm.my

INTELLIGENCE DYNAMICS AND SYSTEM (IDS)

Prof. Ir. Dr. Aminudin Hj Abu, Professor, Head of iKohza
 Assoc Prof. Ir. Dr. Pauziah Muhammad, Associate Professor
 Dr. Zainudin A Rashid, Senior Lecturer
 Dr. Lee Kee Quen, Senior Lecturer
 Dr. Noor Fawazi Md Noor Rudin, Senior Lecturer
 Dr. Samsol Faizal Anis, Senior Lecturer
 Dr. Mohamad Fadzli Hanif, Senior Lecturer

NUMBER OF STUDENTS

- Ph.D : 8
- Master: 4
- Bachelor: 14

RESEARCH KEYWORDS

- vibration
- noise
- computer fluid dynamics

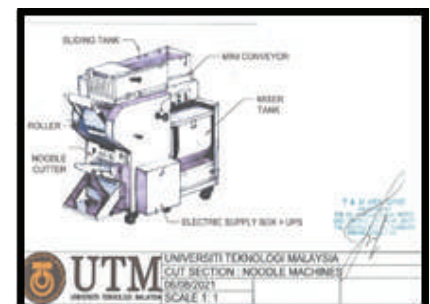
OUTLINE OF IKOHZA

Intelligent dynamics and system laboratory specializing in system dynamics and acoustics. Focusing on converging ideas from various fields and discovering creative research method and idea.

CURRENT RESEARCH

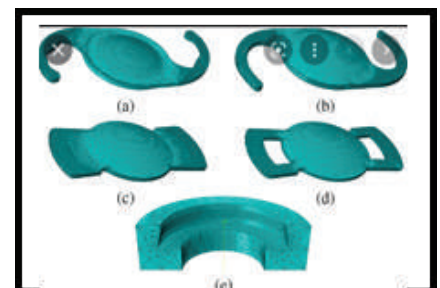
• MEE SIPUT MAKING MACHINE TOTAL (RM 35530)

Newly Modified Haptic Design for an Intraocular Lenses (IOL) using Design of Experiment



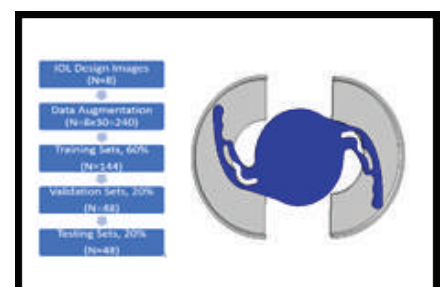
• **RESEARCH 1:** In collaboration with Sultan Ahmad Shah Medical Center (IIUM) and MyIOL Sdn Bhd

Predicting Spatial Displacement Based on Intraocular Lens, Convolution Neural Network, Machine Learning



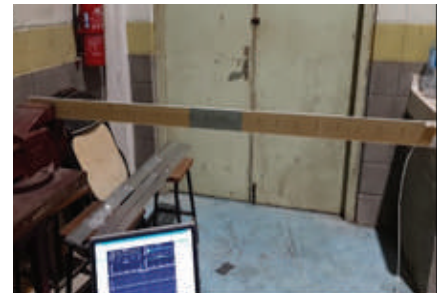
• **RESEARCH 2:** Networking Grant (Total: RM6000)

Improvement Of Mode Shape Curvature Algorithm Using Robust Regression For Damage Detection In Laminated Composite

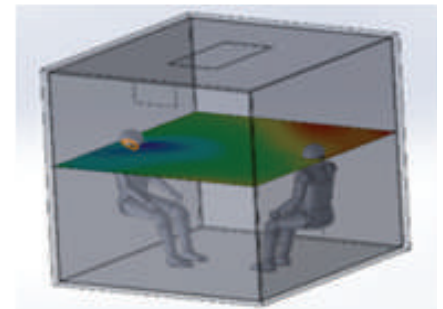


- **RESEARCH 3:** Fundamental Research Grant Scheme (Total RM 61600)

SARS-CoV-2 dispersion rate and its transmission risk in a tertiary hospital setting: simulation study



- **RESEARCH 4:** In collaboration with Sultan Ahmad Shah Medical Center (IIUM)



SDGs:



MERIT OF THE TECHNOLOGY

- Equipped with advance measurement tools for noise and vibration measurement
- A diverse number of researchers

POSSIBLE INDUSTRY APPLICATION

- Innovation with new ideas of technology
- Structural analysis
- Evaluation and improvement of mechanical component

Contact: Prof. Ts. Ir. Dr. Aminuddin Bin Abu
Email : aminudin.kl@utm.my

METABOLIC ENGINEERING AND MOLECULAR BIOLOGY (MEMOBIO)

- Assoc. Prof. Ts. Dr. Nor'Azizi Othman, Head of iKohza
- Prof. Dr. Muhammad Ali Muhammad Yuzir, Professor
- Dr. Fazrena Nadia Md. Akhir, Senior Lecturer
- Dr. Nadia Farhana Azman, Researcher
- Dr. Nurul Syazwani Ahmad Sabri, Post-doctoral Researcher
- Dr. Hirofumi Hara, Visiting Professor, University of Tokyo, Japan
- Dr. Kuroki Yutaka, Visiting Professor, Delightex Pte. Ltd., Singapore
- Dr. Nurul Syahirah Shamsol Anuar, Visiting Researcher, University of Tokyo, Japan

NUMBER OF STUDENTS

- Ph.D : 12 students
- Master: 34 students
- Bachelor: 40 students

RESEARCH KEYWORDS

Biodegradation, Biocoke production, Soil-cooling temperate crops, Gene expression, Lignin bio-depolymerization, Copper biodegradation

OUTLINE OF IKOHZA

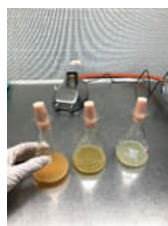
Establishment of MEMO-Bio ikohza is particularly well suited for Malaysia with a wealth of Microorganism yet to be characterized and investigated for their capabilities to degrade pollutants or to create new materials or fine chemicals from biomass. From the vast volumes of biomass from the palm oil and other agro-based industries, there is potential for Malaysia to produce the energy source, such as bio ethanol/bio hydrogen products, and chemical conversions creating high value-added chemical product for industrial and medical materials, such as antibiotics, vitamin, hormone and useful compounds from the action of microbes and modified metabolic pathway of microorganism. MJIT is well equipped with high-end analytical equipment for chemical analysis, gene/genomic analysis, and protein/enzyme analysis.

CURRENT RESEARCH

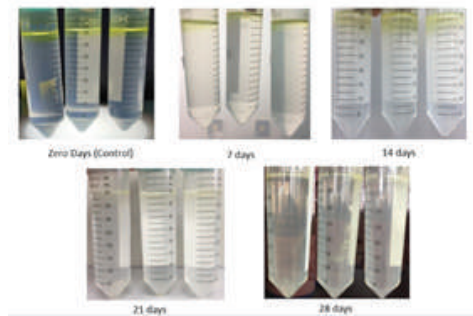
- The Influences of Biomass Components in the Production of Biocoke and Carbonized Biocoke from Oil Palm Empty Fruit Bunch



- Structure and Functional Profiling of Soil Microbial Communities Under Soil Cooling for Temperate Root Crops in the Tropics

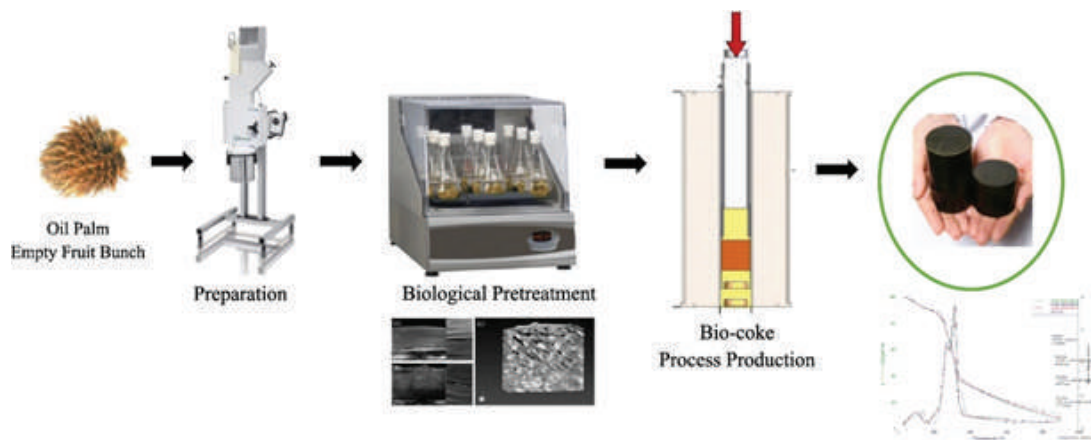


- Evaluation of Cooking Oil Degradation by *Aspergillus fumigatus* from Effective Microorganism Solution



MERIT OF THE TECHNOLOGY

- 1) Biocoke for generation of energy from under-utilized biomass



- 2) Growth of temperate crops in the tropics by introduction of soil-cooling method



POSSIBLE INDUSTRY APPLICATION

- Isolation of microorganisms, extraction of DNAs and performing gene cloning.
- Identification of biofunctional compounds from plants and animals.

Contact: Assoc. Prof. Ts. Dr. Nor'Azizi Othman
Email: norazizio.kl@utm.my

OPTICAL DEVICES AND SYSTEMS (ODESY)

- Ts. Dr. Sumiaty Ambran, Senior Lecturer, Head of Ikohza
- Assoc. Prof. Dr. Azura Hamzah, Associate Professor
- Ts. Dr. Nelidya Yussof, Senior Lecturer
- Dr. Husni Hani Jameela Binti Sapingi, Senior Lecturer
- Professor Minoru Yamada, Professor
- Professor Osamu Mikami, Professor
- Professor Tetsuya Kawanishi, Professor
- Prof. Ir. Dr. Sevia Mahdaliza Sutan Idrus, Associate Professor
- Assoc. Prof. Dr. Norliza Mohamed, Associate Professor

NUMBER OF STUDENTS

- Ph.D : 8
- Master: 9
- Bachelor: 10

RESEARCH KEYWORDS

Optical Communication, Optical Sensors, Amplifiers, Radio over fiber, Optical Interconnect.

OUTLINE OF IKOHZA

Opto-electronics is a basic technology to support a very wide engineering field. Opto-electronics is a key technology in engineering. The ODESY iKohza was founded to establish research activities on opto-electronics such as the optical fiber communication system, the optical fiber amplifiers/ lasers, the optical interconnect and the optical sensing system. Odesy Ikohza has strong collaboration with local and international universities such as Tokai University, Keio University and University of Southampton, United Kingdom. The Ikohza supports the Sustainable Development Goals for Industry Innovation and Infrastructure and Sustainable Cities and Communities.

CURRENT RESEARCH

NO.	RESEARCH TOPICS	GRANT NAME
1	Characterization of Europium Aluminium (EU-AL) Polymer Optical Waveguide Amplifier for In-Vehicle Optical Interconnect	FRGS
2	Multiwavelength Semiconductor Optical Amplifier Fiber Laser Based on Parallel Lyot Filter	FRGS
3	Profiling of Volatile Organic Compound (VOC) in Stingless Bee Honey	TDR - UTM
4	Development of Multimode Europium Aluminium Incorporated Polymer Optical Planar Waveguide Amplifier by Using Mosquito Method	TIER 2 - UTM
5	C-Shaped Optical Fiber Sensor for Petrochemical sensing application	GUP - UTM
6	Development of Certification Methodology for Foreign Object Debris Detection System According to EuroCAE Standard	Contract Research DTD
7	Projek 2.4: Ask Dr Solar! 2.0 Pelestarian dan Pemerksaan Aplikasi Dan Amalan Ilmu Kejuruteraan Elektrik Oleh Pelajar Sekolah Rendah Dan Menengah	Community Grant

MERIT OF THE TECHNOLOGY

1. OPTICAL FIBER BRAGG GRATING SENSOR

Fiber Bragg grating (FBG) is the most favourable technology in sensing application due to its inherent advantages such as improved sensitivity, possibility for multiplexing, tiny size, rapid response, and distributed sensing. It has been used in several measurements such as temperature, strain, pressure, as well as refractive index parameters.

2. MICROMACHINING FOR SENSING APPLICATION

A micromachining technique allows for removing a targeted area (Window shaped) of an optical fiber cladding layer via Computer Numerical Control of micro-milling machining technique. A window-shaped structure offers strong mechanical stability to support the sensor due to more remaining cladding and greater evanescent wave exposure compared to other types of optical sensors. In addition, the technique allows for multiple windows fabrication on the same platform which has the potential to manufacture intelligent sensing device.

3. PULSE LASER

Produces light in the form of optical pulses. In contrast to continuous-wave lasers, it has a high average output power and pulse energy, making it unique. The obligations towards parameters affecting the optical pulses provoked, such as pulse duration, pulse energy, pulse repetition rate, and wavelength, vary the pulse generation and types of pulse laser. Q-switched lasers and mode-locked lasers are the most prominent pulse lasers.

4. FIBER LASER SENSOR

With the implementation of a fiber laser as a sensor, the variety of actual peculiarity, as temperature, strain, pressure, etc. are distinguished by the properties of light as it conveys along the fiber laser. The unprecedented dominances of the fiber laser sensor, such as high sensitivity, electromagnetic interference (EMI) immunity, cost-viability, efficiently multiplexing, and high reliability, have piqued interests during recent decades.

5. SEMICONDUCTOR OPTICAL AMPLIFIER

SOA amplifier is the economic, high-performance solution for long-haul WDM networks. SOA optical amplifiers use the semiconductor as the gain medium, which is designed to be used in general applications to increase optical launch power to compensate for the loss of other optical devices. SOA amplifier, due to its features, can be used in Booster and in-line amplification, an optical network, general-purpose test, and measurement and fiber sensing.

POSSIBLE INDUSTRY APPLICATION

- 1 New fault troubleshooting of Assurance Processes for Fiber Access Network in Telekom Malaysia
- 2 Microstructured Optical Fiber Sensor using Micro-milling Machining for Sensing Application
- 3 Foreign Object Debris Detection - Characterisation and Optimisation
- 4 Optical Fiber Bragg Grating Sensor Application
- 5 Optical Interconnect Device



Contact: Ts. Dr. Sumiaty Ambran,
Email: sumiaty.kl@utm.my

PATTERN RECOGNITION & ROBOTICS AUTOMATION (PRA)

- Associates Prof. Ir. Dr. Zool Hilmi Ismail, Associate Professor, Head of IkoHza
- Associates Prof Ts. Dr. Mohd Ibrahim Shapiai, Associate Professor
- Dr. Uswah Khairuddin, Senior Lecturer
- Ir. Ts. Dr. Mohd Azlan Bin Abu, Senior Lecturer

NUMBER OF STUDENTS

- Ph.D : 20 students
- Master: 12 students
- Bachelor: 46 students

RESEARCH KEYWORDS

AI, ROBOTICS AND CONTROL

Artificial Intelligence, Brain Computer Interface and Swarm Intelligence, Machine Vision, Design Optimization and Workflow, Low Carbon Transport, Automotive Turbocharger, Nonlinear Control, Multiple Agent System, Warehouse Management System, Supply Chain.



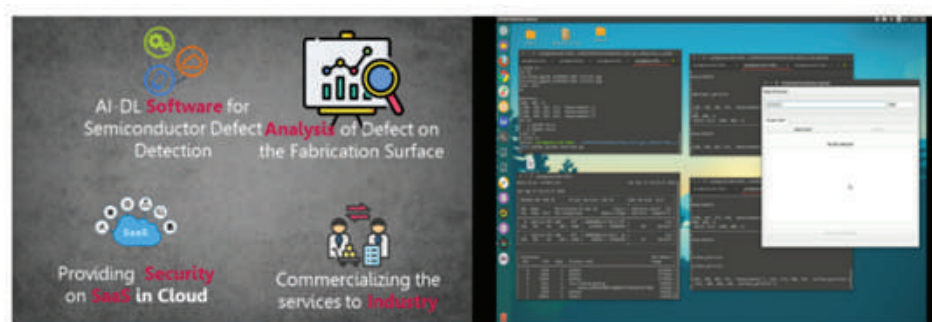
OUTLINE OF IKOHZA

Pattern Recognition and Automation ikohza develops frontier intelligent systems for industries towards wealth creation also promote and disseminate the knowledge of artificial intelligence and robotics technologies state of the art intelligent system solutions to society.

CURRENT RESEARCH

1) DEFECT INSPECTION USING DEEP LEARNING COMPUTER VISION FOR SOFTWARE AS A SERVICE

Providing an intelligent and secured solution for defect inspection in semiconductor industries.



Main Features

Prototype Defect Inspection



2) AI INVENTORY MANAGEMENT SOLUTION FOR LOGISTIC & RETAIL INDUSTRIES

AI Inventory Management System can be turned into rich insights in areas such as operation analysis for warehouse management and retail analytics. It would greatly benefit logistic industries by ensuring a consistent and accurate reporting and cycle counting process.



Location information (Items)



Time to move (Pick, Pack, Transport)



Auto classification for each item



Connected with warehouse drawings



3) ARTIFICIAL INTELLIGENCE VISION SYSTEM FOR CALF WEIGHT ESTIMATION

The purpose of this project is to reinvent calf monitoring and rearing practices and re-evaluate its rearing costs using precision veterinary surveillance system specifically built for dairy youngstock.



Precision Calf monitoring in Collaboration with UPM

MERIT OF THE TECHNOLOGY

- Our server comes with power GPU which can support the deployment of AI system.
- Our project now collaborates with Semiconductor industries.
- The developed technology magic starts with in-store cameras that capture real-time shelf conditions with pixel-perfect accuracy to identify each SKU.
- By automating and continuous shelf scans, warehouse in Osaka, Japan can improve labor efficiency, increase item availability, more importantly faster cycle counting.
- Develop a precise calf weight monitoring system based on machine vision and deep learning algorithms which can provide daily calf weight estimation.
- Develop optimized calf feed intake and medicine modules based on its precise weight estimation and common dairy farming and veterinary practices.
- Estimate the costs of rearing using stochastic bioeconomic model that includes feed and medicine costs as well as fatality losses and to evaluate factors that influence the adoption of technology.

POSSIBLE INDUSTRY APPLICATION

As a premier university-based research laboratory, our lab is well-equipped with the state-of-the-art intelligence system solutions to society. We provide open access, hands-on-training, and courses to the entire university also to external users from both academia and industry. We have strong linkages and networking with both academic institutions and industrial sectors.

POTENTIAL COLLABORATIVE AREA:

- Research-Development-Commercialization-Innovation;
- Community Engagement Training/ Workshops / Seminars;
- Provide AI consultancy for livestock, manufacturing and supply chain industries.

Contact: Assoc. Prof. Ir. Dr Zool Hilmi Ismail
Email: zool@utm.my

SHIZEN CONVERSION & SEPARATION TECHNOLOGY (SHIZEN)

- Prof. Dr. Tomoya Tsuji, Professor (Head of iKohza)
- Dr. Mariam Firdhaus binti Mad Nordin, Senior Lecturer
- Dr. Pramila a/p Tamunaidu, Senior Lecturer
- Dr. Nabilah binti Zaini, Senior Lecturer
- Ir. Dr. Tan Lian See, Senior Lecturer
- Dr. Norhuda binti Abdul Manaf, Senior Lecturer
- Ir. Ts. Dr. Kiew Peck Loo, Senior Lecturer

NUMBER OF STUDENTS

- Ph.D : 5 students
- Master: 4 students
- Bachelor: 14 students

RESEARCH KEYWORDS

Sustainable energy, Biofuels, New materials, Utilization of wastes, Thermodynamic models, Process design & control, Apparatus and assembly design

OUTLINE OF IKOHZA

Separation and reaction process are designed from a view point of physical properties and phase equilibrium. Shizen Ikohza also provides precise physical properties for various industries. Research area is now expanded to development of high performance materials.

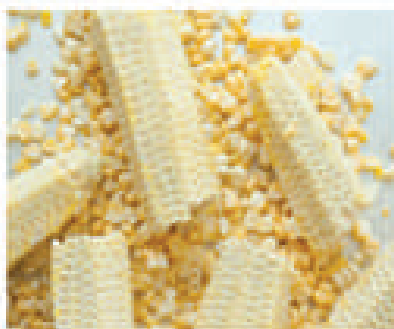
CURRENT RESEARCH

RESEARCH 1: SUSTAINABLE ENERGY & FUELS

1st and 2nd Generation biodiesel Syngas from biomaterials
DME, E10-20 gasoline Highly purified oil & gas (sulfur & mercury free)

RESEARCH 2: NEW MATERIALS

Refrigerants, Spray propellants, Hydrogen storage medium,
Extract by use of hot compressed water, Bio- & synthetic polymers
and monomers,



Corncob



Bioplastic



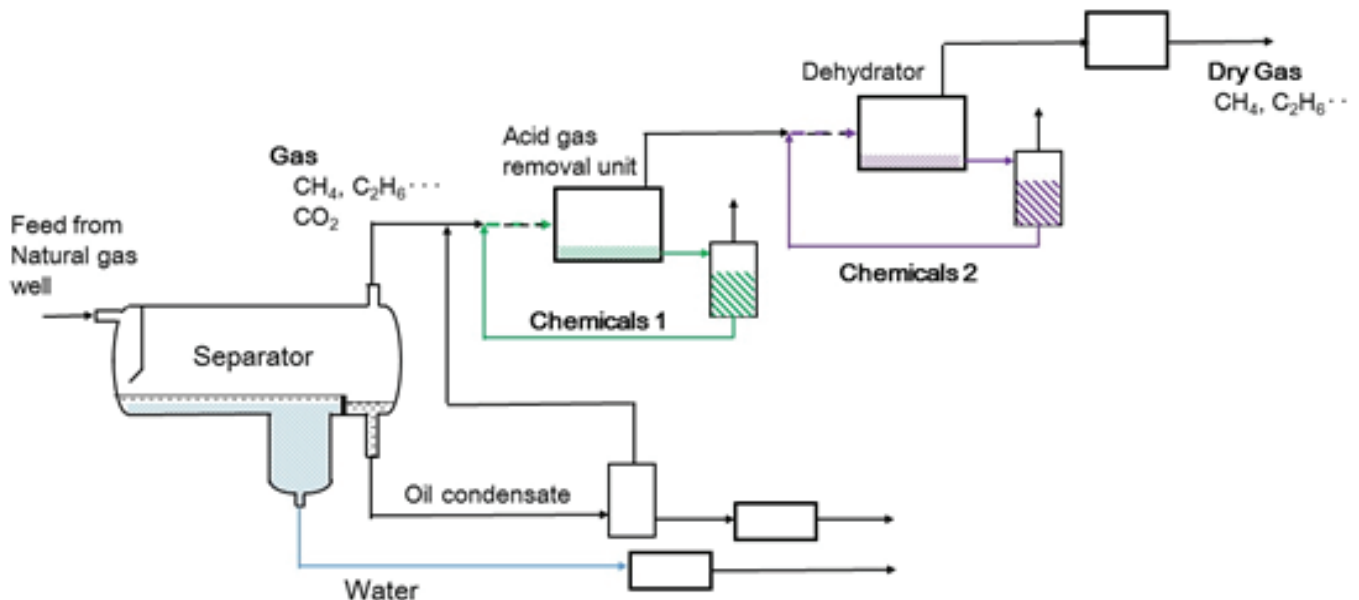
Bioplastic Products

- **RESEARCH 3:** Design of Chemical Process and Control based on mathematical models / physical properties / phase equilibria



MERIT OF THE TECHNOLOGY

- 1) Optimization of Oil & Gas processing units



- 2) Intelligent platform for process simulation Optimization for given reaction and separation process from view point of material / energy balances by using commercialized software and own data / thermodynamic models

POSSIBLE INDUSTRY APPLICATION

- Providing apparatus for physical property measurements
- Measurement and Prediction models for physical properties and phase equilibria
- Development of flowsheet based on industrial data and thermodynamic model (We had more than 25 collaboration / researches with Industries)

Contact: Prof. Dr. Tomoya Tsuji
Email: t.tsuji@utm.my

SOFTWARE ENGINEERING OF INDUSTRIAL REVOLUTION (SEIR)

- Dr. Halinawati Binti Hirol, Senior Lecturer, Head of ikohza
- Prof. Dr. Ts. Ali Selamat, Professor
- Dr. Nor Shahida Binti Hasan, Senior Lecturer
- Dr. Zatul Alwani Binti Shaffie, Senior Lecturer

NUMBER OF STUDENTS

- Master: 1 student
- Bachelor: 66 students

RESEARCH KEYWORDS

- Software Engineering
- System Development
- Database
- System Analysis and Design
- IoT (Internet of Things)

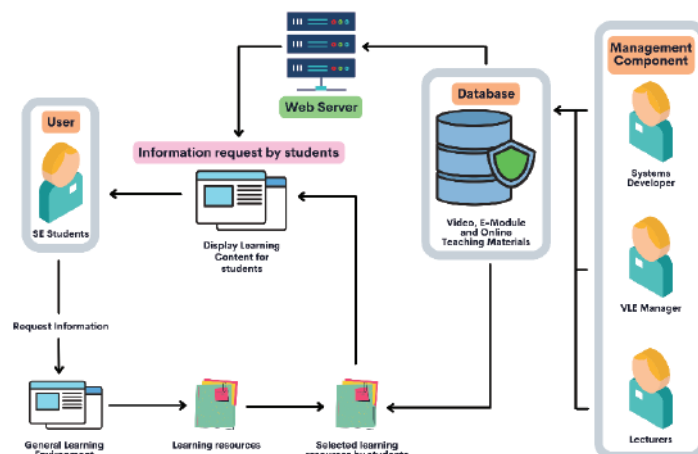
OUTLINE OF IKOHA

The iKohza of SEIR is established to promote research on industrial revolution in software engineering field. With Industry 4.0 the role of software, and herewith software engineering, has gained even further momentum and become a critical core competence for developing and maintaining smart interconnected system

CURRENT RESEARCH

• RESEARCH1: UTM R&D GRANT

Development of Database Systems for Videos, E-Module and Online Teaching Material for Software Engineering Program.
(Total: RM 84,133.42)



- **RESEARCH2: FRGS MOHE GRANT**

The Establishment of Meshfree (PIM, RPIM and EFG) Formulation for Flood Modelling and Analysis.
(Total RM: 70,200)

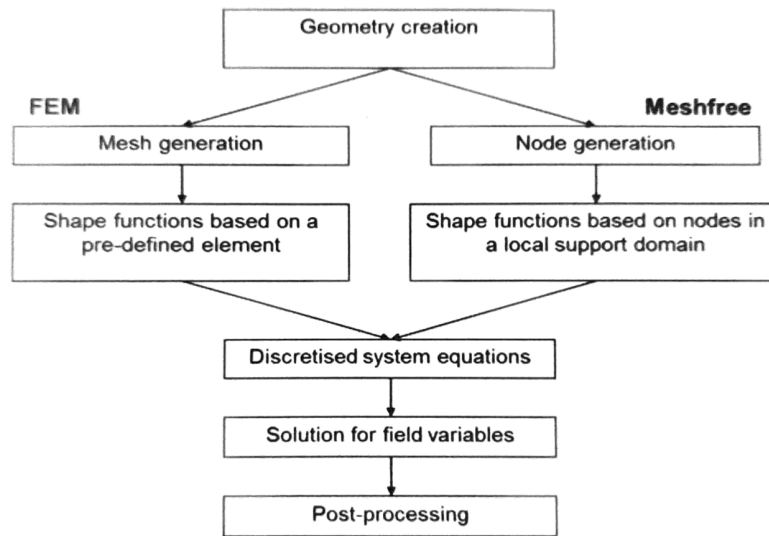
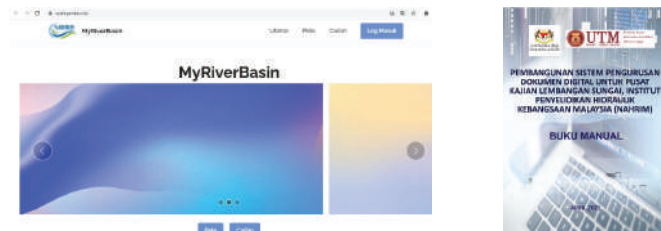


Figure 2.1: Flowchart for the FEM and Meshfree methods (Liu and Gu, 2005)

MERIT OF THE TECHNOLOGY

- System Development



- IoT



POSSIBLE INDUSTRY APPLICATION

- Development of file systems.
- Development of database systems.

Contact: Dr. Halinawati binti Hirol
Email : halinawati@utm.my

TAKASAGO THERMAL/ENVIRONMENTAL SYSTEMS (TTES)

- Prof. Dr. Yutaka Asako, Professor (Head of iKohza)
- Assoc. Prof. Dr. Nor Azwadi Bin Che Sidik, Associate Professor
- Dr. Siti Rahmah Binti Aid, Senior Lecturer
- Dr. Tan Lit Ken, Senior Lecturer

NUMBER OF STUDENTS

- Ph.D: 8 students
- Master : 3 students
- Bachelor : 8 students

RESEARCH KEYWORDS

Low carbon, energy saving technologies, heat transfer

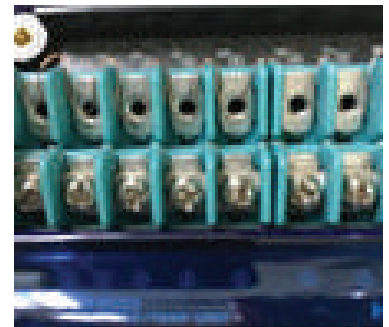
OUTLINE OF IKOHZA

Outline of ikohza: TTES iKohza is specialised in Thermal and Fluid Sciences especially Renewable Energy and Energy Saving Technologies. This laboratory is established based on generous financial support from Takasago Thermal Engineering Co. Ltd.; which is a major Japanese Air Conditioning Construction Company.

CURRENT RESEARCH

UNCERTAINTY OF MEASURED TEMPERATURE

Thermocouple is a widely used temperature sensor. Since thermoelectromotive force of the thermocouple is proportional to the junction temperatures difference, the Reference Junction Compensation (RJC) is automatically conducted in a data logger. Uncertainty of the measured temperature is required for evaluation of the measure data. To obtain the uncertainty of the measured temperature, we have to know the RJC error. However, it takes times and effort. An easier and faster way to obtain the RJC error is strongly required. A new easier and faster way to obtain the RJC error is developing in this research.



Thermocouple wire connection

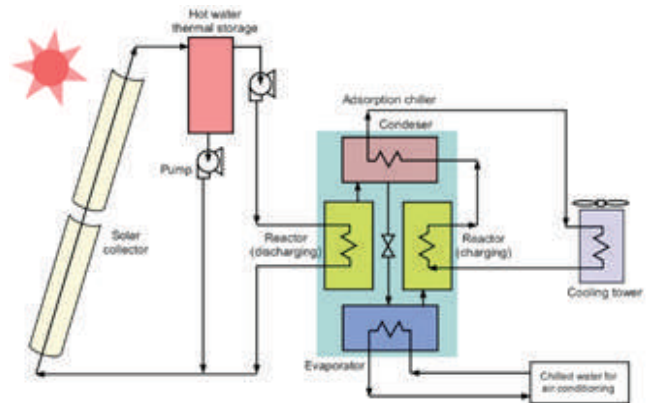


HIGHLY DOPED/ACTIVATED GE SUBSTRATE/ SYNTHESIS OF NANOPARTICLE/NANOFLUID

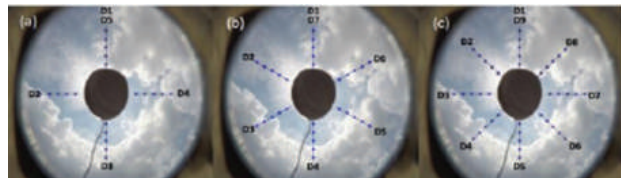
This research explores the potential to utilize germanium (Ge) substrate, and nanofluid-based optical filter in hybrid PV/T system, to cater for the urgent need for highly efficient, small, solar harvesting systems.

MERIT OF THE TECHNOLOGY

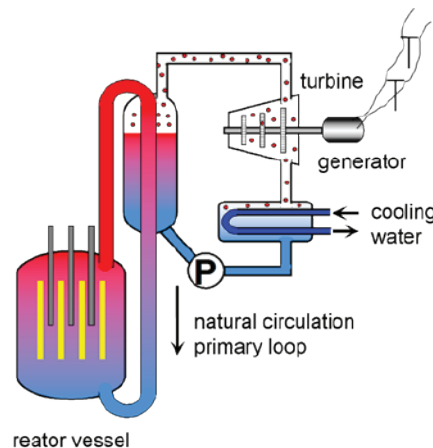
- Solar Adsorption Refrigeration Cycle



- Prediction of working fluid temperature at Solar corrector tube exit
- Prediction of Global Solar Radiation using Artificial Neural Networks



- Instability Analysis of Natural Circulation Cooling of Super Critical Water Reactor



POSSIBLE INDUSTRY APPLICATION

We publish many fundamental research papers on wide range of thermal problems in professional journals. Therefore, we could support industrial researches from the theoretical side. Also we are experts in CFD and we have own codes which handle laminar & turbulent, incompressible & compressible, subsonic and supersonic flows.

- Consultation on thermal problems
- Numerical Analysis (FLUENT, ...)
- Morphological analysis of material

Contact: Prof. Dr. Yutaka Asako
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TAKASAGO THERMAL/ENVIRONMENTAL SYSTEMS (TTES)

TRIBOLOGY AND PRECISION MACHINING (TRIPREM)

- Professor, Dr. Kanao Fukuda, Head of iKohza
- Associate Professor, Dr. Nur'azah Abdul Manaf
- Senior Lecturer, Dr. Jun Ishimatsu
- Senior Lecturer, Dr. C.Eng., Shahira Liza Kamis
- Post-Doctoral Researcher, Dr. Noor Ayuma Tahir
- Assistant Research Officer, Nur Rasyidah Rusli
- Research Assistant, Kua Loan Kiat
- Research Assistant, Bakhit Irfan Yusoff

NUMBER OF STUDENTS

- Ph.D : 3 students
- Master: 9 students
- Bachelor: 6 students

RESEARCH KEYWORDS

Tribology, precision machining, surface modification, polishing, lapping, grinding, humidity

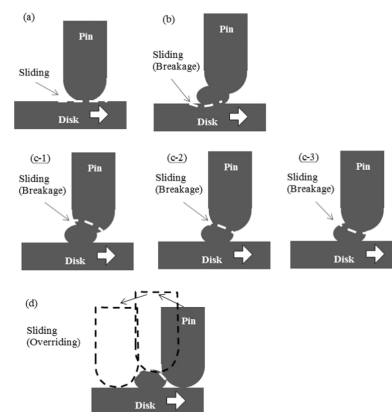
OUTLINE OF IKOHA

Tribology and Precision Machining i-Kohza (TriPreM) is established to research fundamentals of tribological phenomena and support related industries through the research activities and cultivating students and i-Kohza members. Our philosophy and interest is to develop solutions for practical problems from scientific view point.

CURRENT RESEARCH

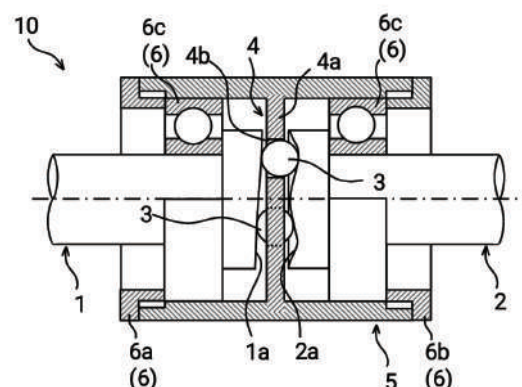
RESEARCH 1:

Adhesive wear mechanism study



RESEARCH 2:

Mechanical transmission development



- **RESEARCH 3:**

Piano action tribology

- **RESEARCH 4:**

Trace humidity controller development

- **RESEARCH 5:**

Development of composite coating - Synthesis/growth of oxide and metal coating, as well as expand their potential as self lubricated coating

- **RESEARCH 6:**

Development of bio-coating for biomedical applications

- **RESEARCH 7:**

Development of Ultrasonically assisted effector for cutting/grinding fluid

- **RESEARCH 8:**

Development of ball screw shaft finishing machine

Our SDGs



MERIT OF THE TECHNOLOGY

- 1) Spatiotemporal sliding phenomena analysis technology (granted Japanese patent 2719275)
- 2) Trace humidity (ppb-ppm) control technology (granted Japanese patent 6052661)
- 3) Polishing technology (granted Japanese patent 3973962)
- 4) Novel transmission (granted Japanese patent xxxxxxx)
- 5) Coating technology (copyright LY2021E07012, MyIPO)

POSSIBLE INDUSTRY APPLICATION

- Lubrication technology development
- Surface modification for tribological use
- Precision humidity (ppb-ppm level) control
- Characterization and analysis of materials and devices

Contact: Professor, Dr. Kanao Fukuda (Head of iKohza)
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VEHICLE SYSTEM ENGINEERING (VSE)

- Dr. Fauzan B. Ahmad Senior Lecturer, Head of iKohza
- Assoc. Prof. Dr. Wira Jazair B. Yahya, Associate Professor
- Assoc. Prof. Dr. Mohd Azizi B. Abdul Rahman, Associate Professor
- Assoc. Prof. Ir. Ts. Dr. Nurulakmar Bt. Abu Husain, Associate Professor
- Dr. Ahmad Muhsin B. Ithnin Senior Lecturer
- Dr. Mohd Hatta B. Mohammed Ariff, Senior Lecturer

NUMBER OF STUDENTS

- Ph.D : 21 students
- Master: 12 students
- Bachelor : 14 students

RESEARCH KEYWORDS

Bio-signal Processing, AI & Robotics, Active Safety & Autonomous Vehicles, Vehicle Safety, Product Design, Structural Dynamics, Smart Materials

OUTLINE OF IKOHZA

The Vehicle System Engineering (VSE) ikohza is a highly dedicated research group with activities and facilities spanning the field of alternative fuel for efficient combustion in automotive, smart materials fabrication & application, future driving & active safety technologies in vehicles. VSE has close collaboration with industries and some of the top universities in the world, thus enabling access to state-of-the-art testing equipment and technology know-how.

CURRENT RESEARCH

RESEARCH 1: BIOSIGNAL PROCESSING & ROBOTICS

This research focuses on the development of the instrumented healthcare device for wearable passive controlled ankle orthosis for post-stroke rehab treatment. The output of this research work is a physical prototype of a wearable device that helps measure the gait patterns for lower limb therapy or biomechanics study.



RESEARCH 2: REAL-TIME NON-SURFACTANT EMULSION

Fuel Supply System (RTES)

Emulsion fuel can reduce exhaust emissions and fuel consumption of diesel engines and burners. RTES can produce emulsion fuel without addition of surfactant or additives.



RESEARCH 3: ASEAN ANTHROPOMORPHIC MANIKIN

Development of 6- and 10-years-old-sized manikins to act as child surrogates or reference tools for relevant design and vehicle safety assessment.



MERIT OF THE TECHNOLOGY

- Wearable Passive Controlled Ankle Foot Orthosis – Figure 1
- Save fuel consumption and reduce exhaust emissions – Figure 2
- Indigenous manikin design based on actual ASEAN children's anthropometric database – Figure 3



Figure 1: Health care



**Figure 3:
Anthropomorphic
Manikin**

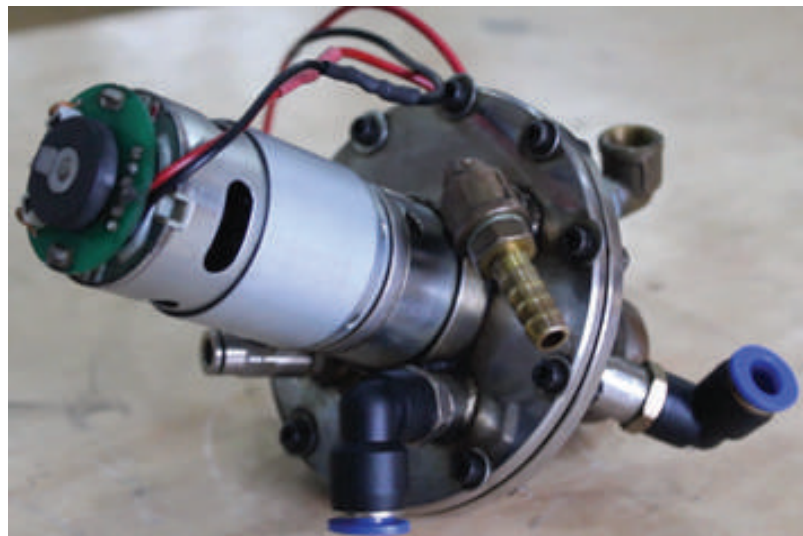


Figure 2: RTEs

POSSIBLE INDUSTRY APPLICATION

- Assistive device, exoskeleton, wearable prototype in health care industries.
- With a focus on Artificial Intelligence (AI), machine learning, and automated systems, we push the limit in transforming energy systems and road transportation (www.rtes.my)
- Established collaboration with MIROS/ASEAN NCAP and ACTS Smart Solutions Sdn Bhd (www.actssmartsolutions.com)

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WELLNESS INNOVATION TECHNOLOGY (WIT)

- Dr. Azila Abdul Aziz, Associate Professor, Head of iKohza
- Dr. Siti Hamidah Mohd Setapar, Associate Professor
- Dr. Roshafima Rasit Ali, Associate Professor

NUMBER OF STUDENTS

- Ph.D : 5 students
- Master: 2 students
- Bachelor: 2 students

RESEARCH KEYWORDS

Plant extract, nanocarriers, cosmetic, wellness, formulation

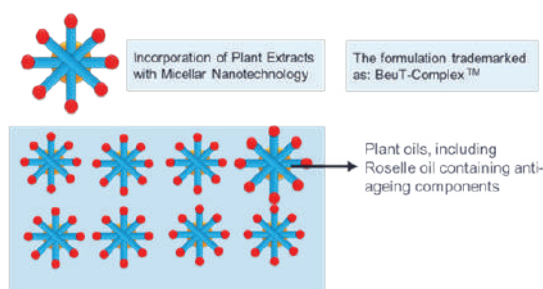
OUTLINE OF IKOHZA

Wellness Innovation Technology (WIT) iKOHZA has been established to further strengthen research in the field of wellness product development, which conducted in UTM for almost 20 years. With the establishment of this iKohza, R&D will inculcate high values in the innovation and commercialization of Japanese technological concept of research. Several collaborations with several Japanese companies and institutions will be involved related to the field of wellness. Through this iKohza, various activities will be focusing on strengthening the fundamental aspects of new research, enhance the production of innovations and new inventions, empowering commercialization and consultation with development of short courses, mentoring and collaboration with various parties communities.

CURRENT RESEARCH

- **RESEARCH 1:** Novel Micellar Nanotechnology for Cosmetic Formulation (Funded by MyLAB MoHE Grant; RM 638,000).

Project on cosmetic-based formulation from incorporation of extracted Roselle oil with micellar nanoparticle technology for advance anti-ageing effects of products.



- **RESEARCH 2:** Unravelling the Effect of Gold Nanoparticles with Chitosan Nanobubbles through Double Emulsion Technique as Anti-cancer Drug Delivery System. (Funded by FRGS MoHE Grant; RM 116, 098)
Project on fundamental research of gold nanoparticles incorporation with chitosan nanobubbles in double emulsion system as novel drug delivery for anti-cancer therapeutic performance.
- **RESEARCH 3:** Targeting of curcumin loaded hyaluronan-modified flexible liposomes to inflamed keratinocytes for the management of psoriasis: mechanism of binding and kinetic studies. (Funded by FRGS MoHE Grant; RM 151,536)
Project on binding mechanism and kinetic studies of curcumin extract



incorporated hyaluronan-modified liposomal nano-delivery system for innovative approach of psoriasis management

- **RESEARCH 4:** Extraction of Roselle-Based Omega-3 Fatty Acid (Funded by UTM Research Fellow Grant; RM 33,300)
Project on Roselle plant extraction, focusing on Omega-3 essential fatty acid as innovative source of health supplement
- **RESEARCH 5:** Extensive Study on Roselle Plants Extract as Sustainable Natural-Based High Quality Nutrition Sources (Funded by UTM CRG Grant; RM 100,000)
Project on application of Roselle plant extract for health and wellness product that involved characterization studies, product formulation and market study survey.
- **RESEARCH 6:** Sustainable Source Of Dietary Supplement From Roselle Seeds Extract (Funded by Industrial Grant; RM 51,000)
Project focusing on Roselle seeds extract as sustainable material for dietary supplement product
- **RESEARCH 7:** Pain Reliever Gel from Eucalyptus Globulus Essential Oil Using Micellar Technology (Funded by Industrial Grant; RM 51,000)
Project on application of Eucalyptus globulus essential oil as pain reliever gel that being formulated advanced via incorporation with micellar nanoparticle technology



MERIT OF THE TECHNOLOGY

Green extraction techniques and nanotechnology implementations are the focusing technology through the iKOHZA research, which involved fundamental studies, application, product formulation and development and final concept for commercialization or market penetration approach. The merit of technology involved for each current research in Wellness Innovation Technology iKOHZA are listed as below.

- 1) Enhance therapeutic efficacy of cosmetic formulation via nano-technological approach. (Nanotechnology system implemented: Micellar nanoparticle technology)
- 2) Advance anti-cancer compound via nano-drug delivery system. (Nanotechnology system implemented: Gold nanoparticles with chitosan nanobubbles)
- 3) Empowering curcumin extract application in psoriasis management via active component loaded nanocarrier. (Nanotechnology system implemented: Hyaluronate-modified liposomes)
- 4) Promote safer alternative of pain killer substance from Eucalyptus globulus essential oil by incorporating with nanocarrier. (Nanotechnology system implemented: Micellar nanoparticle technology)
- 5) Green extraction technique used (supercritical fluid extraction) for high nutritional values of plant extracts

POSSIBLE INDUSTRY APPLICATION

The possible industrial collaboration is depending on different aspects involve through the iKOHZA development:

- 1) Clinical Testing for Cosmetic and Health Products: Collaboration with agencies (eg; SIRIM BERHAD and Healthmedic Research Sdn. Bhd)
- 2) Marketing for Product Commercialization and Distribution: Collaboration with marketing partner
- 3) Product International Penetration: Collaboration with government agencies; MATRADE and international companies (eg: Japan wellness companies)
- 4) CSR Program for Communities: Collaboration with school organizations, institutions, government and non-government agencies for knowledge transfer, brand awareness and funding with communities.

Contact: Associate Professor Dr. Azila Abdul Aziz
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WIND ENGINEERING AND ENVIRONMENT (WEE)

- Assoc. Prof. Ir. Ts. Dr. Sheikh Ahmad Zaki Shaikh Salim, Associate Professor, Head of iKohza
- Assoc. Prof. Dr. Mohamed Sukri Mat Ali, Senior Lecturer
- Ts. Dr. Mohd Fitri Mohd Yakub, Senior Lecturer
- Dr. Farah Liana Mohd Redzuan, Senior Lecturer
- Dr. Ahmad Faiz Bin Mohammad, Senior Lecturer
- Dr. Nurshafinaz Mohd Maruai, Senior Lecturer

NUMBER OF STUDENTS

- Ph.D : 17 students
- Master: 11 students

RESEARCH KEYWORDS

Heat Urban Island, Thermal Comfort, Wind Engineering, Control Application, IoT, Artificial Intelligent, Air Conditioning (HVAC)

OUTLINE OF IKOHZA

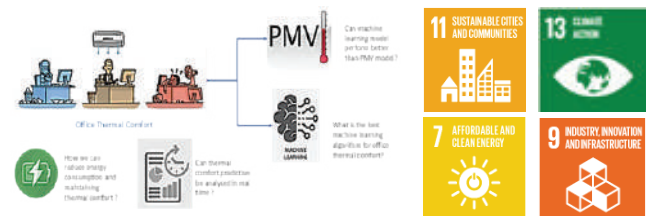
The iKohza Wind Engineering for (Urban, Artificial, Man-made) Environment Laboratory is established to conduct pertinence research that related to the wind engineering applications. Research activities currently undergoing in this lab are concerned particularly on improving the efficiency of urban ventilation, enhancing pedestrian thermal comfort within an urban area, harnessing wind energy for green urban development and other practical interests that are related to bluff body flow. Our

research activities are multidisciplinary, where we stretch out our research activities to the other fields such as human behavior in term of energy consumption, social system, control system and its application, internet of thing, artificial intelligent and green technology. Our strong collaboration with several institutions in Japan and Malaysia provides not only enhance the research activities but also provides a platform for information and technology sharing.

CURRENT RESEARCH

1. THERMAL COMFORT ASSESSMENT BASED ON INTERNET OF THINGS

The thermal comfort IoT monitoring system comprises environment sensors which are a temperature sensor, humidity sensor, wind speed sensor, and mobile application. This study investigates the thermal comfort associated with different air conditioning (AC) thermostat set point temperatures in centralized heating, ventilation, and air conditioning (HVAC) office using IoT and machine learning monitoring system.



2. SMART AIR QUALITY AND INFECTION CONTROL

Indoor air quality typically encompasses monitoring and prediction solution based on the latest IoT sensors and machine learning capabilities, providing a platform to measure numerous indoor contaminants. For this purpose, an IoT node consisting of several sensors for 8 pollutants including NH₃, CO, NO₂, CH₄, CO₂, PM 2.5 along with the ambient temperature & air humidity is developed.



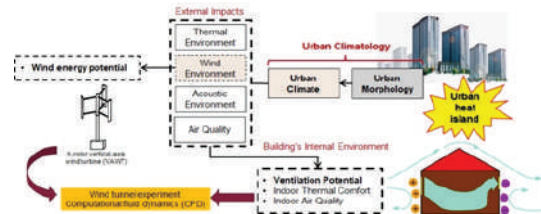
3. AERODYNAMIC NOISE REDUCTION ON WIND TURBINES USING CFD

Wind turbine noise is far more annoying compared to other type of noise at the same A-weighted noise level. Our research focus on the noise generation from the turbulent-airfoil interactions as it was found the main annoying noise source radiated from the wind turbine.



4. URBAN MICROCLIMATE ANALYSIS AND WIND ENERGY HARNESSING POTENTIAL

Adopting computational fluid dynamics (CFD) simulations and wind tunnel experiments, extensive research on various UCL models is performed to create a database that will be used for morphometric analysis, empirical modelling of urban microclimate, and wind energy assessment in low-wind-speed urban areas.



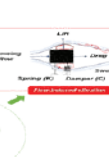
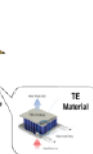
5. THERMOELECTRIC DEVELOPMENT TOWARDS HARVESTING HEAT ENERGY

Complementing the effort of iKohza to stretch out multidisciplinary research work, this study focusses on the theme of renewable energy.

6. NUMERICAL INVESTIGATION ON PASSIVE VIBRATION CONTROL DIMENSION TO ENHANCE THE PROSPECT OF LOW WIND ENERGY HARVESTING

Study of envelopes the prospect of flow-induced vibration from ambient resources such as air and water to produce a reliable and secured energy for microelectronic devices. The mechanism of flow-induced vibration is further explored by means of passive flow control to find a robust configuration of flow energy harvester.

More than 50% of heat is wasted!



MERIT OF THE TECHNOLOGY

1) WIND TUNNEL LABORATORY

The wind tunnel is powered by a blower of 45 kW that can produce a maximum speed in the test section of 30m/s (108 km/h). It is an open atmospheric wind tunnel with a cross sectional area of 1.35m (w)*1.0m (h) and it is designed with a long test section (9.0m), one of its kind in Malaysia. The test sections are divided into three sub-sections to cater aerodynamics and wind engineering studies.

2) WEATHER STATION DATA

1. Tower Station is located at rooftop Malaysia-Japan Institute of Technology building:
Campbell-Scientific® Weather Station CR1000 datalogger c/w Enclosure, NL115 Ethernet & Compact Flash Module, 3D Ultrasonic Anemometer, Temp/RH sensor, Silicon Pyranometer & Rain Gauge.

POSSIBLE INDUSTRY APPLICATION

1. WIND ENGINEERING

- Building Aerodynamics- Safety, comfort and urban design
- Wind engineering- Flow induced vibration-energy
- Cross wind- vehicle/train safety

2. AERONAUTICS

- Bio-inspired airfoil: Aerodynamics and Aeroacoustics
- Passenger car aerodynamic performances

Contact: AP. Ir. Ts. Dr Sheikh Ahmad Zaki.
Email: sheikh.kl@utm.my

DISASTER PREPAREDNESS AND PREVENTION CENTER (DPPC)

- Dr. Khamarrul Azahari Razak, Senior Lecturer, Director
- Sr. Dr. Siti Uzairiah Mohd Tobi, Senior Lecturer
- Dr. Dr. Liew Wai Loan, Senior Lecturer
- Dr. Mohammad Ali Tareq, Senior Lecturer
- Ts. Dr. Doris Toe Hooi Chyee, Senior Lecturer

NUMBER OF STUDENTS

- Ph.D : 19 students
- Master: 11 students

RESEARCH KEYWORDS

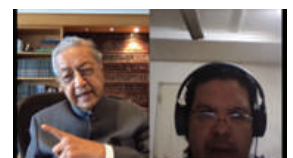
DRR, Community Resilience, Space Science R&D, Policy, Corporate Governance, Islamic Finance, Engineering Education, Open Innovation, SGD, Technology Mapping, Patent Analytics, Cultural Heritage, Urban Conservation, Climate Action in the Buildings Sector, Green Technology, Fire Risks Assessment, Sustainable Cities.

OUTLINE OF IKOHZA

The Disaster Preparedness and Prevention Center (DPPC), is a leading disaster risk reduction and management (DRRM) institute in multi-hazards and climate change to strengthen community resilience. DPPC ikohza aims to champion in providing DRRM solutions through technology driven and risk-informed sustainable development agenda; to lead and facilitate high-end laboratories, facilities and asset management services for disaster related event; to become a regional hub for building a safer and disaster resilient community through a transdisciplinary approach; to facilitate national and international collaborations in applied research, training and field practices for disaster resilience.

CURRENT RESEARCH

- **RESEARCH 1:**
Local Government DRR Capacity Survey
- **RESEARCH 2:** Development of a Framework for Evaluating the Benefits of Space Science R&D in Malaysia
- **RESEARCH 3 :** Debris Flow Modelling and Water Quality Implications after the 2015 Sabah Earthquake
- **RESEARCH 4:** Multi Approach Guideline for Resilient Office Buildings towards Reducing Disaster Risk (MAGROB)



- **RESEARCH 5:** Urban Morphology Study of Seremban Historic Town Centre
- **RESEARCH 6:** Integral Aspects for Sustainable City Development of Malaysian Cities through Study of Their Early Urban Morphological Characters

MERIT OF THE TECHNOLOGY

- 1) The crux of this survey is to examine the DRRM capacity of state and local governments and their agencies.
- 2) The simulated result could provide important insight for improving the management of hazards and risks in this tectonically active area.
- 3) The guideline framework for evaluation space science R&D benefits with regards to the social-economic development of the nation
- 4) To assess the risks faced by the office building owners during flood in monsoon season and examine the mitigation approach from both the structural and nonstructural measures for office building.

POSSIBLE INDUSTRY APPLICATION

- 1) Focusing on risk analysis and relevant inputs using the PESTEL (Political, Economic, Social, Technological, Legal, and Environmental) and SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis methods.
- 2) Space science R&D can be evaluated using Triple Bottom Line (TBL) theory to measure the performance or output of space science R&D consists societal, environmental and economics. Generally, this framework will be a good start in preparing Malaysia to have Malaysia Space Act (MSA) and become a versatile space emerging countries and in line with international initiative such as UNISPACE+50 and Space 2030.
- 3) Assessing the current status of the building and recognising the areas or fields that can be improved to enhance the resilience of the building, especially in facing natural disaster such as flood.
 - Development of urban conservation plan and management
 - Heritage impact assessment
 - Identification of significant heritage for national heritage listing
 - Adaptive reuse of heritage buildings
 - Fire risks assessment of cultural heritage
 - Physical characterization of urban form
 - City planning for spatial sustainability

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MALAYSIA-JAPAN ADVANCED RESEARCH CENTRE (MJARC)

- Dr Pramila Tamunaidu, Senior Lecturer, Director
- Prof Dr Masafumi Goto, Professor
- Ts Ir Dr Liew Peng Yen, Senior Lecturer
- Ts Dr Abd Halim Md Ali, Senior Lecturer
- Ts Dr Vekes Balasundram, Senior Lecturer

NUMBER OF STUDENTS

- Ph.D : 13 students
- Master: 17 students
- Bachelor: 14 students

RESEARCH KEYWORDS

Waste Treatment & Management Technologies, Energy Systems & Recovery

OUTLINE OF IKOHA

A new research group working on many transdisciplinary projects focusing of advanced technologies and solutions on

- 1) Waste-to-Wealth, Waste-to- Energy
- 2) Effluent treatment
- 3) Energy systems and recovery
- 4) Pre & Post-disaster Waste management

Our SDGs



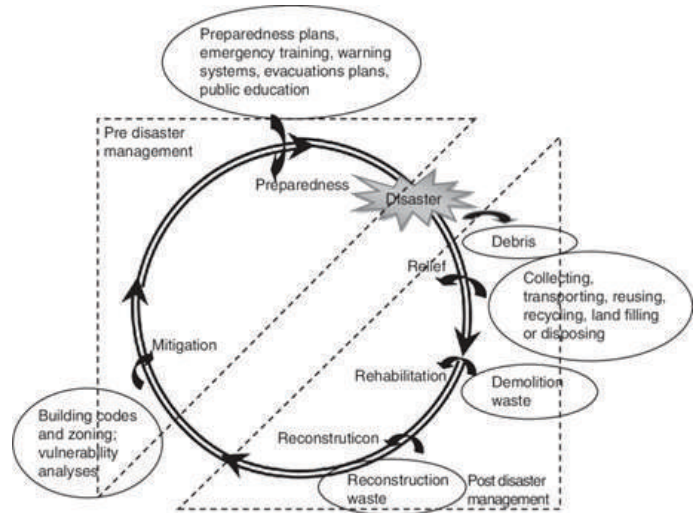
CURRENT RESEARCH

- **RESEARCH 1:** Transformation of agricultural waste to high quality products using sub-critical water technology

- 1) Subcritical Water Technology is a Green technology – water as solvent to break organic materials
- 2) Organic materials - Decomposed into smaller molecules within 1 hour
- 3) Solid and liquid products can be formulated into soil rehabilitizer, fertilizer, animal feed and biodegradable packaging



- **RESEARCH 2:** Environmental impact and techno-economic assessment on energy systems based on various renewable energy supply and hydrogen energy supply chain, as well as waste management system
- **RESEARCH 3:** Multi-energy system planning for industrial-urban symbiosis and eco-industrial park
- **RESEARCH 4:** Pre & Post Disaster Waste Management Developing mechanisms for handling, treatment, reuse, and recycling of disaster-generated debris that must comply to standard technical practice in solid waste management system as well as the emergency response and recovery system



MERIT OF THE TECHNOLOGY

MJARC has the strength to offer multiple services from fundamental research and development to commercialization and innovation. The expertise in MJARC has vast experience in processes and product development mainly in waste treatment and transformation as well as energy systems and recovery. However, we are also active in Knowledge-Transfer-Programs and impart our knowledge to a vast group of people including professionals, students and also community.

POSSIBLE INDUSTRY APPLICATION

Our services include but not limited to:-

- 1) Research-Development-Commercialization-Innovation
- 2) Consultancy
- 3) Techno-economic Assessment
- 4) Certified Professional Training
- 5) Community Engagement Training/ Workshops / Seminars

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UTM
UNIVERSITI TEKNOLOGI MALAYSIA

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International
Institute of Technology
(MJIT)



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